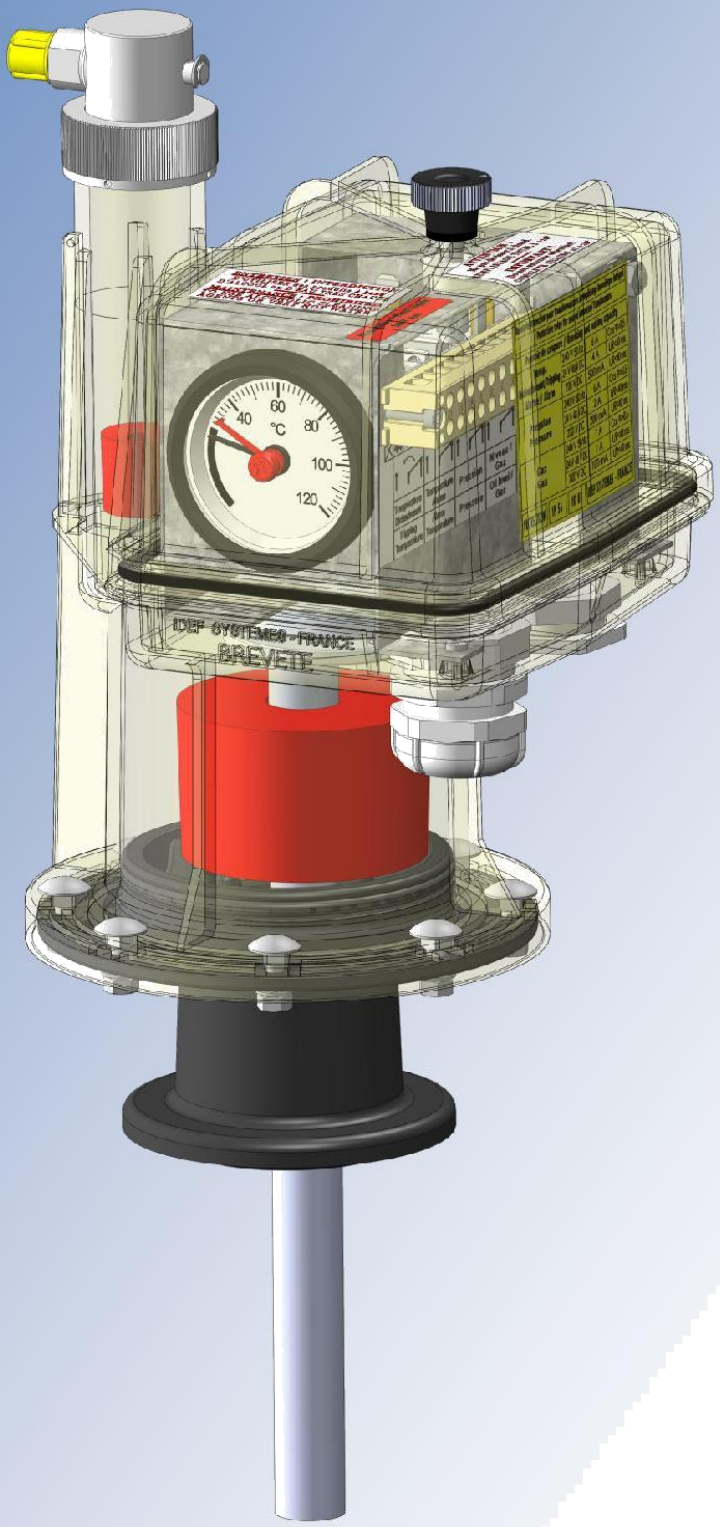
DMCR 3.0 Protection Relay

Technical Manual



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THE DMCR 3.0 PROTECTION RELAY

DMCR 3.0
Protection Relay

The Detection, Measurement and Control Relay (DMCR ®) is a protection relay for oil-filled distribution transformers. The DMCR 3.0 is designed and manufactured in France by IDEF SYSTEMES (®) in accordance with Standard EN 50216-3. The DMCR 3.0 is a complete safety solution for hermetically-sealed oil-filled transformers which combines 4 different safety functions into a single, compact and solid device.

TEMPERATURE

- **Two Adjustable Thermostat Switches** with changeover contact for over temperature detection. Both the primary and secondary temperature thresholds are factory set at customer requirements within a 30°C to 120°C range
- **One Thermometer** with maximum temperature indicator provides visual temperature information

PRESSURE

- **One Adjustable Pressure** Switch with changeover contact. The tripping overpressure threshold of the pressure switch is factory set at customer requirement within a 0,1 – 0,5 bar range

DMCR

DIELECTRIC LEVEL

- **Reed Magnetic Switch** with changeover contact is triggered when a dielectric-level decrease of over 170 cm³ is achieved
- An **integrated magnetic protection** shields the Reed Switch from any magnetic field interference (patented design)

PRESENCE OF GAS

- Gassing and dielectric-level decrease is initially visible through the **lowering of a small float** inside the upper part of the DMCR
- This is followed by the **lowering of the main float visible all-round at 360°** (patented design)

TECHNICAL FEATURES

Designed and Manufactured in accordance with	**EN 50216-3**
IEC 60529 Protection	**IP56**
IEC 62262 Shock Resistance	**IK10**
ENVIRONMENTAL CONDITIONS IEC 60721-3-4	
Climatic Conditions	4K2
Special Climatic Conditions	4Z2+4Z4+4Z7
Biological Conditions	4B1
Chemically Active Substances	4C2
Mechanically Active Substances	4S3
Mechanical Conditions	4M4
ISO 9227 Salt Spray Test	C5M
Maximum Relative Pressure	+3 Bar
Ambient Temperature Range	-40°C<T<+70°C
Maximum Temperature	+120°C
PRESSURE Adjustment Scale	100 to 500 mbar
ALARM Temperature Adjustment Scale	30°C to 120°C
TRIPPING Temperature adjustment Scale	30°C to 120°C
DIELECTRIC LEVEL Tripping Threshold	170cm^3 fixed oil-level decrease

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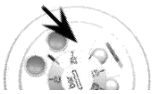
PATENTED DESIGN

IDEF SYSTEMES has patented two design features which are unique to the DMCR relay:

- **360° Dielectric Level Visibility:** the DMCR casing is a transparent UV-resistant reservoir which enables visibility of the dielectric level from all directions
- **Integrated Magnetic Protection:** the magnet which triggers the dielectric level contact is ring-shaped and shields the reed switch. This protects the switch from any external magnetic fields up to 25mT

FUNCTIONS & TESTING

OVER-PRESSURE DETECTION



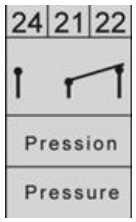
Pressure Switch Knob Set Point

An adjustable pressure switch inside the DMCR detects over-pressure in the transformer tank. It features a changeover contact actuated by a membrane which deforms under pressure.

The over-pressure tripping threshold is factory-set at customer requirement within a 100 to 500 mbar range. In the absence of any specific customer request a 250 mbar setting is applied by default. It is recommended that any threshold modification be done on a test bench equipped with calibrated pressure captors to achieve the highest level of precision.

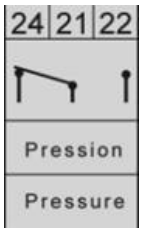
Normal Situation

The pressure in the transformer is below the setpoint of the pressure switch.



Over-Pressure

The pressure in the transformer is above the setpoint of the pressure switch. The electrical contact switches.



TEST: The pressure switch can be tested when the internal pressure of the transformer is above 100 mbar. To test turn the knob anticlockwise until the minimum level before setting it back to the initial set point.

Warning: For a correct adjustment, the pressure knob must be turned clockwise until the maximum set point (500 mbar), and then turned back anticlockwise to the required set point.

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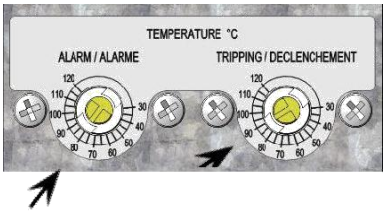
OVER TEMPERATURE DETECTION & TEMPERATURE INDICATION



Thermostat Switches Set Points

Two adjustable thermostat switches detect over-temperature in the transformer tank. These switches feature changeover contacts actuated by a temperature probe situated in the DMCR thermowell immersed in the transformer tank.

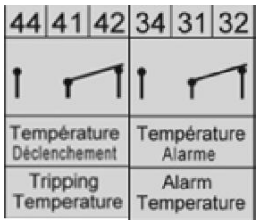
Both thermostats (primary/alarm and secondary/tripping) are factory-set at customer requirement within a 30°C to 120°C range. In the absence of any specific customer request a 80°C (primary/alarm) and 90°C (secondary/tripping) setting is applied by default. It is recommended that any threshold modification be done on a test bench equipped with calibrated temperature captors to achieve the highest level of precision.

A thermometer with maximum temperature indicator provides visual indication of temperature from a probe also located inside the DMCR thermowell.

Thermometer with maximum temperature indicator

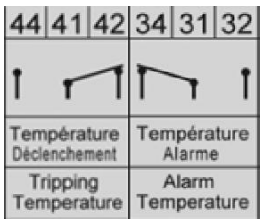
Normal Situation

The temperature in the transformer tank is below the temperature setpoints of both thermostat switches: the primary/alarm and secondary/tripping.



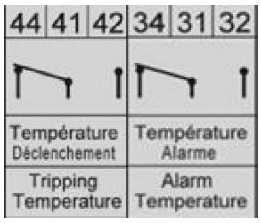
Over-Temperature Primary/Alarm

The temperature in the transformer tank is above the temperature setpoint of the primary/alarm switch but below the temperature setpoint of the secondary/tripping switch. The primary/alarm thermostat switches.



Over-Temperature Secondary/Tripping

The temperature in the transformer tank is above the temperature setpoint of the secondary/tripping switch. The secondary/tripping thermostat switches.



TEST : The thermostat switches can be tested by turning the knob anti-clockwise to the minimum level before setting them back to their initial set points.

Warning: For a correct adjustment, the setting knob must be turned clockwise to the maximum set point (120°C), and then turned back anti-clockwise to the required set point.

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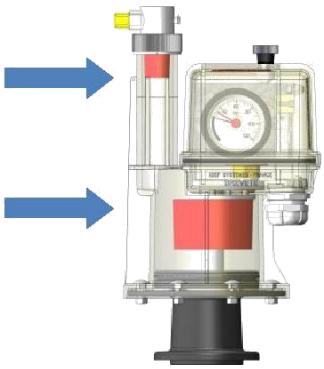
DIELECTRIC-LEVEL MONITORING & GAS DETECTION



Position of Small and Large DMCR Floats in Normal Situation

The DMCR casing is a small see-through reservoir fitted on the top of the transformer tank. If gas forms inside the transformer it will accumulate inside the DMCR casing and cause the dielectric level to drop. Gassing and dielectric-level decrease is initially visible through the lowering of a small float inside the upper part of the DMCR. This is followed by the lowering of the main float visible all-round at 360° (patented design).

A reed magnetic switch with changeover contact is triggered when a dielectric-level decrease of 170cm^3 is achieved. The magnet which triggers the dielectric level contact is ring-shaped and shields the reed switch. This protects the reed switch from interference of any external magnetic fields up to 25mT (patented design).

Normal Situation or small dielectric-level drop

The transformer is fully filled with dielectric. Both DMCR floats are in high position. In the case of a dielectric-level drop of less than 170cm^3 the small float will lower and provide a visual indication. The electrical contact does not switch.

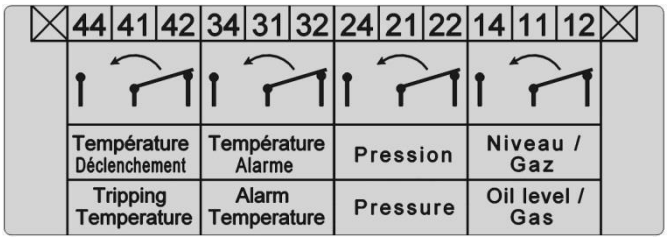
Dielectric-level drop of over 170 cm³

Both DMCR floats will move to low position. The large float triggers the reed magnetic switch. The electrical contact switches.

TEST: The dielectric level contact can be tested with the help of a magnet sufficiently strong to pull the large DMCR float down which will then trigger the reed switch. The strong magnet is used to move the large float down but does not directly act upon the reed switch thanks to the integrated magnetic protection.

CONNECTIVITY & WIRING DIAGRAM

All switches of the DMCR relay are connected to a standard 12-contact 2.5mm² connecting bench. The relay is equipped with a PG21 cable gland and can be equipped with a second cable gland if required.



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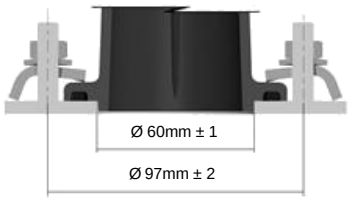
ELECTRICAL FEATURES

ELECTRICAL CONTACTS	Voltage (V)	Switching current (A)	Selfing electrical conditions	Maximum current (mA)	Minimum contact life
ALARM & TRIPPING THERMOSTATS	240V 50/60Hz	6.0	CosΦ>0.5	2000	1000
	24-48VDC	4.0	L/R<40ms		
	220VDC	0.5	L/R<40ms		
PRESSURE SWITCH	240V 50/60Hz	6.0	CosΦ>0.5	2000	1000
	24-48VDC	2.0	L/R<40ms		
	220VDC	0.2	L/R<40ms		
GAS/OIL LEVEL CONTACT	240V 50/60Hz	1.0	CosΦ>0.5	2000	1000
	24-48VDC	1.0	L/R<40ms		
	220VDC	0.1	L/R<40ms		

DIELECTRIC STRENGTH OF CONTACTS	Rated short duration power frequency withstand voltage (r.m.s.)
Between contacts & ground mass	2.5 kV
Between contacts	1.0 kV

FIXING KIT & MOUNTING INSTRUCTIONS



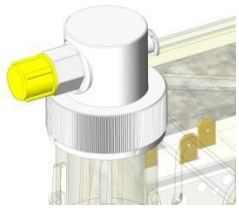
Fitting the DMCR

The DMCR is supplied with a complete fixing kit which includes:

- a toric gasket in FPM
- four M8 nuts, washers and brackets in zinc-plated steel (RoHS) or stainless steel (optional)

The protection relay is to be fitted on a Ø 60mm +/- 1 hole on the top of the transformer tank. We recommend tightening the nuts in position (onto either four M8 studs at 90° or three at 120°) with a 6.0 Nm torque.

DRAIN TAP & BLEEDER



Drain tap & Bleeder

The DMCR is equipped with an easily accessible drain tap and a bleeder on the top of the relay which serve the following two functions:

- enable gas or dielectric sampling through the opening and closing of the bleeder (a male G1/8 sampling petcock). The bleeder can be also used to remove small amounts of remaining air or gas in the relay with the use of an inverted pump. Opening and closing of the bleeder is done with a 13 wrench and a maximum tightening torque of 1.0 Nm should be applied when closing
- enable the dielectric oil filling of the DMCR relay through the removal of the drain tap and of the small float

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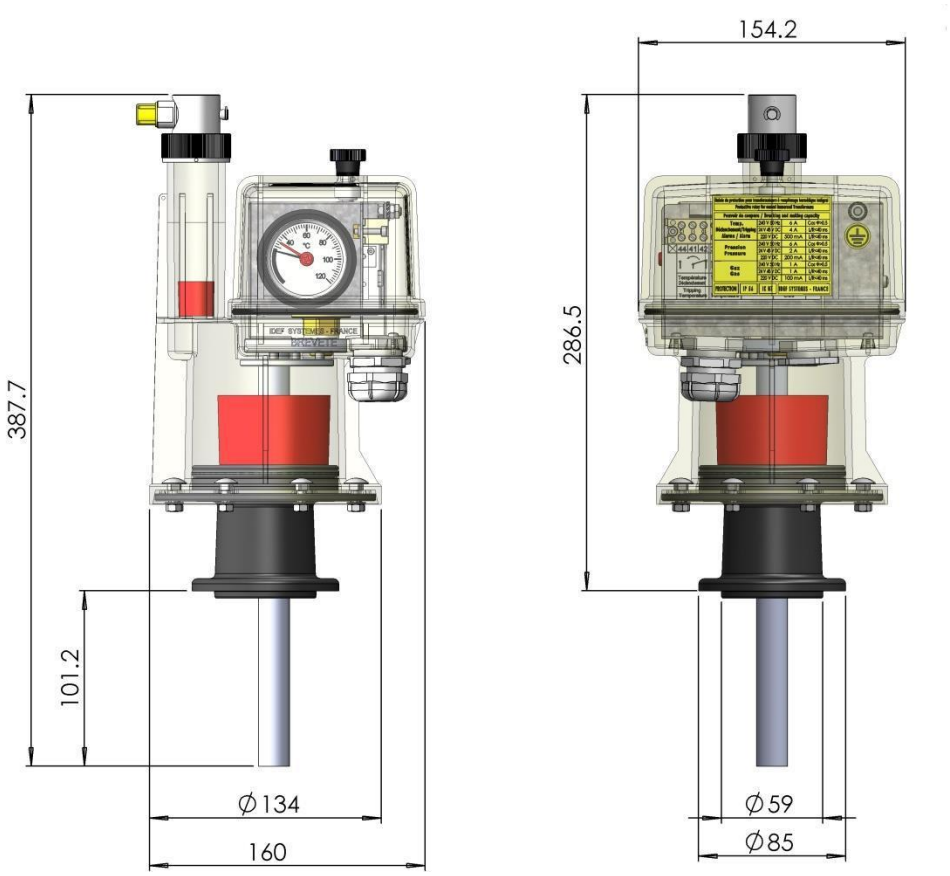
AVAILABLE OPTIONS

Depending on customer requirements IDEF SYSTEMES can offer a number of different options to the DMCR relay. Please do not hesitate to contact us with any specific enquiry. Standard options include:

- a relay with a PT100 probe for dielectric temperature monitoring,
- a relay with a flange suitable for use with a conservator tank,
- a relay with two simultaneous contacts for pressure and dielectric-level,
- a relay with IP66 protection.

DMCR DIMENSIONS & TECHNICAL DRAWING



Note: dimensions in mm

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